



# LITEMAX



## DLF/DLH0625

### Sunlight Readable 6.5" LED B/L LCD

## User Manual

(1st Edition 2011/3/30 )

All information is subject to change without notice.

Approved by	Checked by	Prepared by
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**RECORD OF REVISION**

Version and Date	Page	Old Description	New Description	Remark
Mar,30,2011	all		Preliminary Release	

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## 1.0 GENERAL DESCRIPTION

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DLF/DLH0625 TFT LCD monitor, built-in 1000 nits high brightness for sunlight readable display. It offers the best visibility, performance and cost effective value. The high level of brightness together with the optimal contrast ratio renders high quality images and enhances legibility. With its fast response time and LED backlight technology, the monitor brings remarkable display quality and durability for your applications. Suitable for military, medical, and industrial application.

### 1.1 FEATURES

- Sunlight Readable
- LED Backlight
- High Shock & Vibration Resistance
- Low Power Consumption
- Wide Temperature. Range(-30~80°C)
- High Uniformity
- Low EMI Noise
- Wide Dimming
- Life Expectancy

### 1.2 GENERAL SPECIFICATIONS

Model No.	DLF0625	DLH0625
Description	6.5" TFT LCD monitor, LED Backlight 1000 nits, VGA	
Backlight	LED Backlight	
Display Area (mm)	132.48 x 99.36 mm	
Brightness	1,000 cd/m <sup>2</sup>	
Resolution	640 x480 (VGA)	
Contrast Ratio	600 : 1	
Pixel Pitch (mm)	0.207(H) x 0.207(V)	
Viewing Angle	160°(H), 140°(V)	
Display Colors	16.2M colors	
Response Time (Typical)	25ms (Typical)	
Power Input	DC 12V	
Power Consumption	3.86W	
Dimensions (mm)	153x118x10.9mm	
Weight (Net)	0.2Kg	

### 1.3 ABSOLUTE MAXIMUM RATINGS

#### TFT LCD Module

Item	Symbo	Min	Max	Unit	Remark
Logic/LCD Drive Voltage	VDD	-0.3	+4.0	Volt	Ta= 25°C
LCD Input Signal Voltage	VIN	-0.3	+4.0	Volt	Ta= 25°C
LED BLU Drive Voltage	V <sub>LED</sub>	0	25	Volt	Ta= 25°C
LED Dimming Input Voltage	V <sub>PWM</sub>	0	6	Volt	Ta= 25°C

#### ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Min	Max	Unit	Remark
Operating Temperature	TOP	-30	+80*	°C	Note 1, 2
Operation Humidity	HOP	5	95	%RH	Note 1, 2
Storage Temperature	TST	-30	+80*	°C	Note 1
Storage Humidity	HST	5	95	%RH	Note 1

Note 1: Maximum Wet-Bulb should be 39□ and no condensation.

Note 2: Only operation is guaranteed. Optical and display performance should be evaluated at 25□ only.

\*: Panel surface temperature



### 3.0 SIGNAL Characteristic

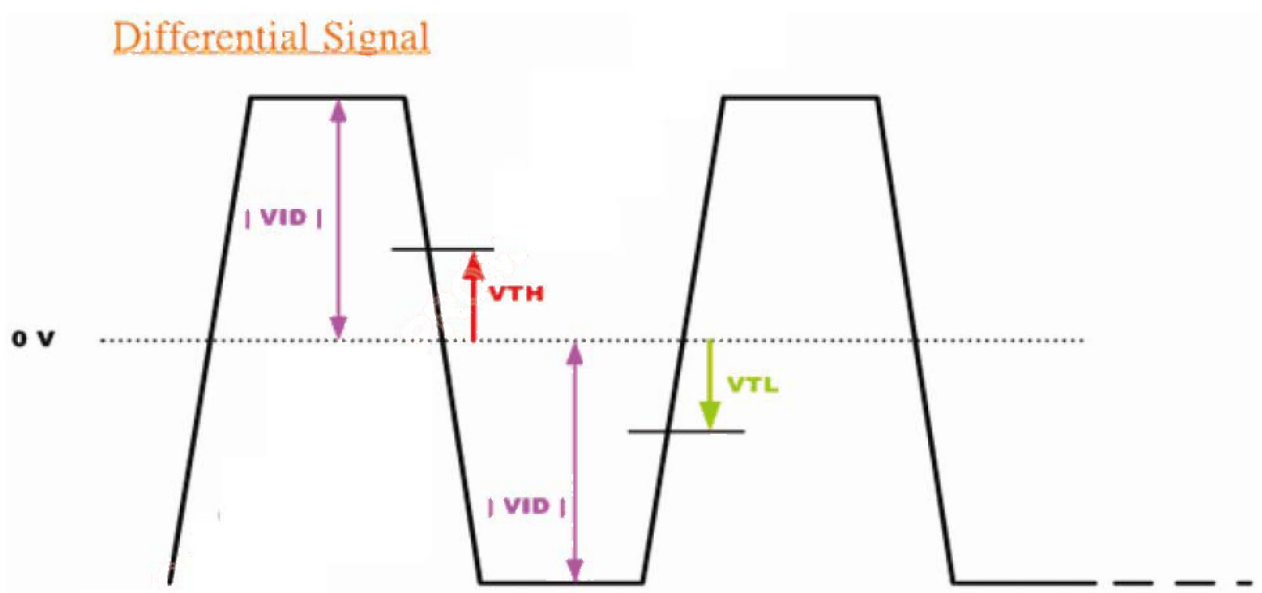
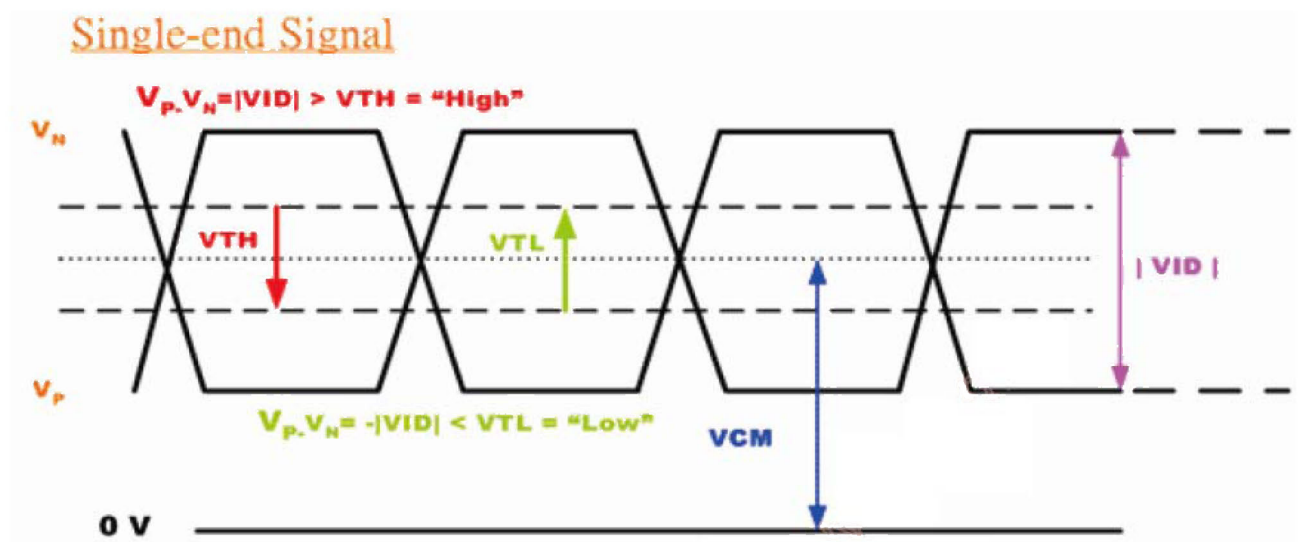
Input Signals should be low or Hi-Z state when VDD is off.

#### LVDS signal

LVDS Transmitter: THC63LVDM83A (THINE) or equivalent

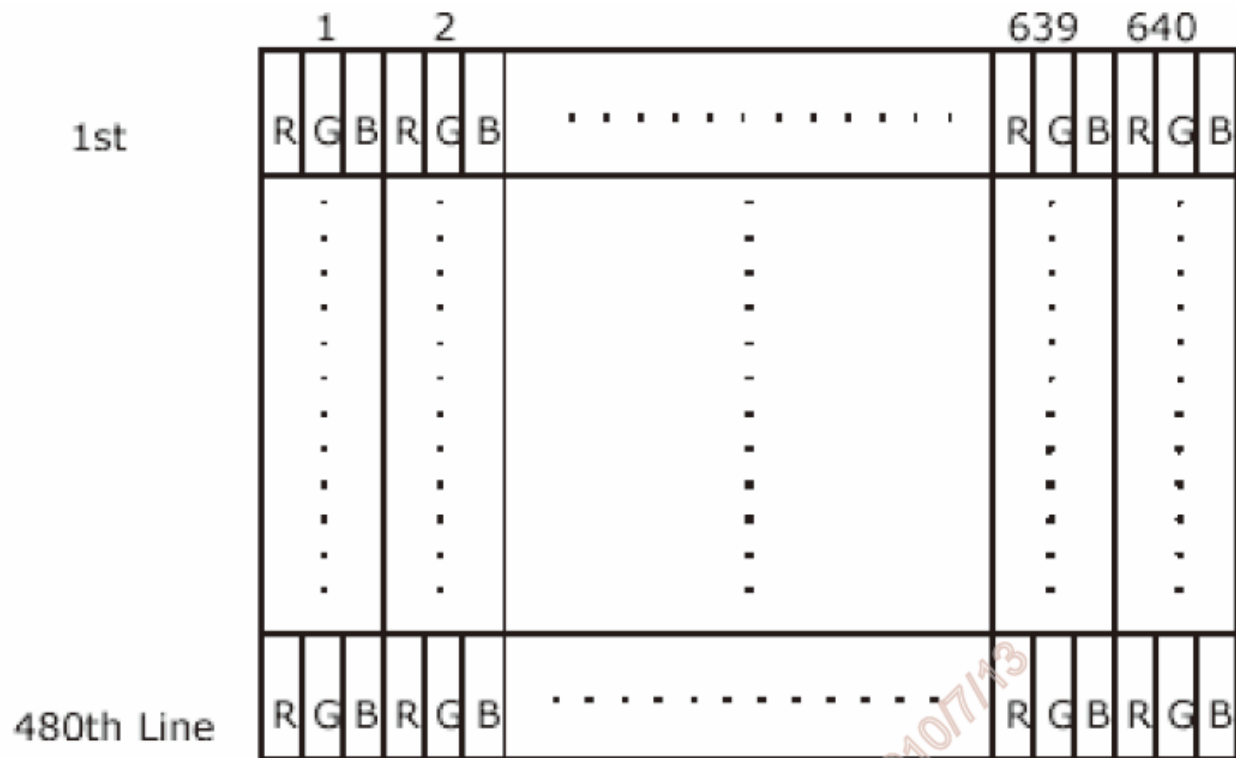
Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Differential Input High Threshold	VTH	-	-	100	mV	VCM=1.20V
Differential Input Low Threshold	VTL	-100	-	-	mV	VCM=1.20V
Input Differential Voltage	VID	100	400	600	mV	
Differential Input Common Mode Voltage	VCM	1.1	-	1.45	V	VTH, VTL= ±100mV

Note 1: LVDS Signal Waveform.



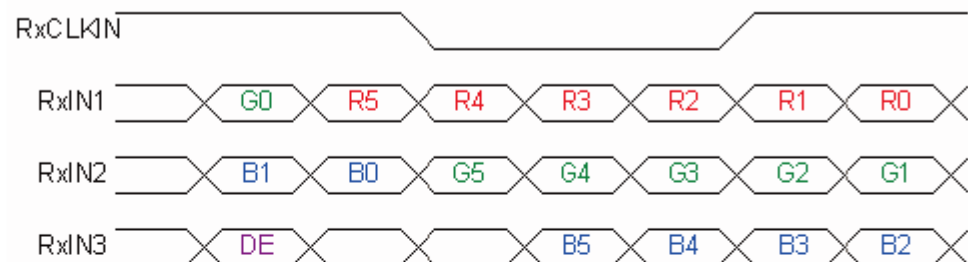
## Pixel Format Image

Following picture shows the relationship between the input signal and LCD pixel format.

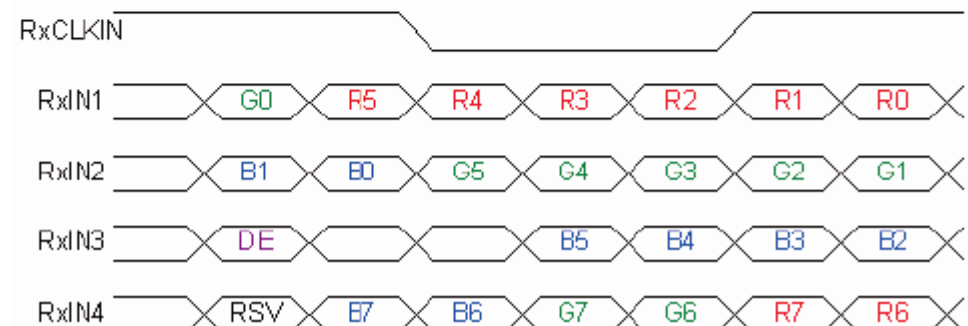


## The Input Data Format

**SEL68 = "Low" or "NC" for 6 bits LVDS Input**



**SEL68 = "High" for 8 bits LVDS Input**





Signal Name	Description	Remark
R7 R6 R5 R4 R3 R2 R1 R0	Red Data 7 Red Data 6 Red Data 5 Red Data 4 Red Data 3 Red Data 2 Red Data 1 Red Data 0	Red-pixel Data  For 8Bits LVDS input MSB: R7 ; LSB: R0  For 6Bits LVDS input MSB: R5 ; LSB: R0
G7 G6 G5 G4 G3 G2 G1 G0	Green Data 7 Green Data 6 Green Data 5 Green Data 4 Green Data 3 Green Data 2 Green Data 1 Green Data 0	Green-pixel Data  For 8Bits LVDS input MSB: G7 ; LSB: G0  For 6Bits LVDS input MSB: G5 ; LSB: G0
B7 B6 B5 B4 B3 B2 B1 B0	Blue Data 7 Blue Data 6 Blue Data 5 Blue Data 4 Blue Data 3 Blue Data 2 Blue Data 1 Blue Data 0	Blue-pixel Data  For 8Bits LVDS input MSB: B7 ; LSB: B0  For 6Bits LVDS input MSB: B5 ; LSB: B0
RxCLKIN	LVDS Data Clock	
DE	Data Enable Signal	When the signal is high, the pixel data shall be valid to be displayed.
RSV	Reserved Signal	"High" or "Low" is acceptable

Note 1: Output signals from any system shall be low or Hi-Z state when VDD is off.

## TFT-LCD Interface Signal Description

LVDS is a differential signal technology for high-speed data transfer LCD interface. LVDS Transmitter shall be THC63LVDM83A (THINE) or equivalent.

Pin No.	Symbol	Pin Description
1	VDD	Power supply, 3.3V (typical)
2	VDD	Power supply, 3.3V (typical)
3	GND	Ground
4	SEL68	Selection for either 6bit or 8bit LVDS input: SEL68 = "Low" or "NC", accepts 6bit LVDS data input; SEL68 = "High", accepts 8bit LVDS data input.
5	RxIN1-	Negative LVDS differential input (R0-R5, G0)
6	RxIN1+	Positive LVDS differential input (R0-R5, G0)
7	GND	Ground
8	RxIN2-	Negative LVDS differential input (G1-G5, B0-B1)
9	RxIN2+	Positive LVDS differential input (G1-G5, B0-B1)
10	GND	Ground
11	RxIN3-	Negative LVDS differential input (B2-B5, DE)
12	RxIN3+	Positive LVDS differential input (B2-B5, DE)
13	GND	Ground
14	RxCLKIN-	Negative LVDS differential clock input
15	RxCLKIN+	Positive LVDS differential clock input
16	NC	No connection
17	U/D	Vertical Reverse ("L" or NC: Normal, "H": Reverse)
18	R/L	Horizontal Reverse ("L" or NC: Normal, "H": Reverse)
19	RxIN4-	Negative LVDS differential input (R6-R7, G6-G7, B6-B7) NC for 6bit LVDS input.
20	RxIN4+	Positive LVDS differential input (R6-R7, G6-G7, B6-B7) NC for 6bit LVDS input.

Note 1: "Low" stands for 0V. "High" stands for 3.3V. "NC" stands for "No Connection".

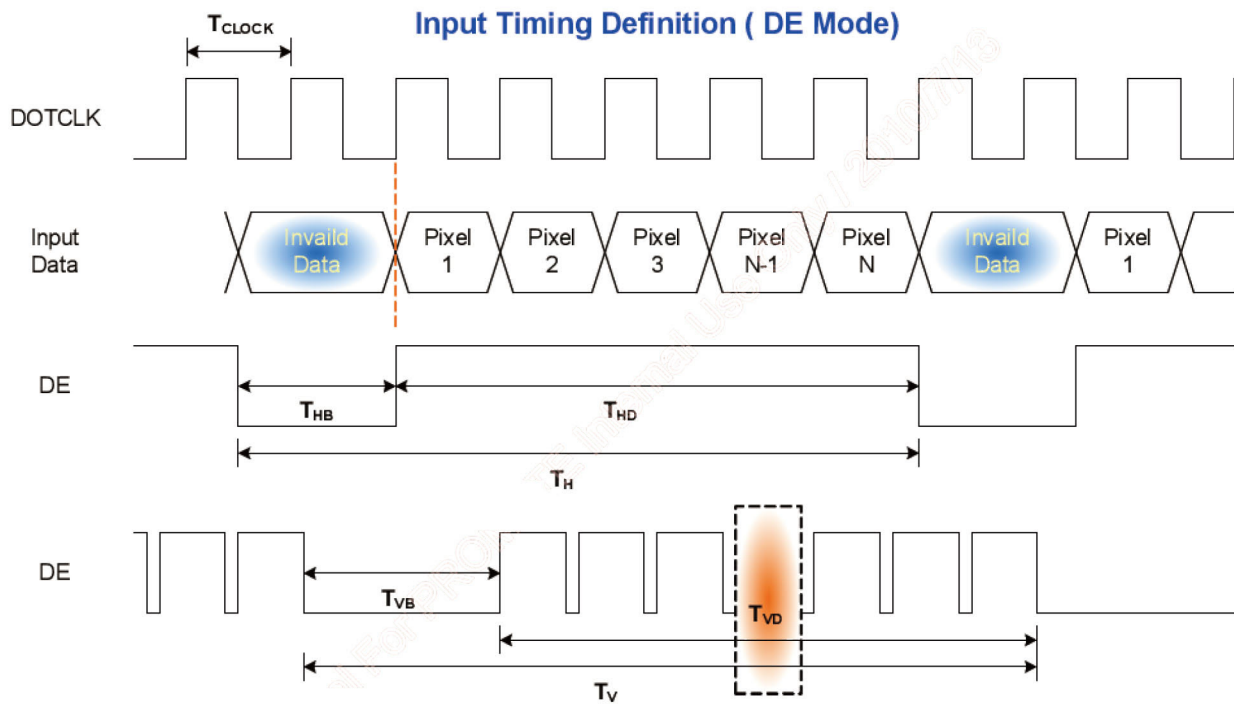
#### 4.0 TIMING Characteristics

DE mode only

Signal		Symbol	Min.	Typ.	Max.	Unit	Remark
Clock frequency (DOTCLK)		1/ T <sub>CLOCK</sub>	20	25.2	50	MHz	Note 1
Horizontal Section	Period	T <sub>H</sub>	770	800	1070	T <sub>CLOCK</sub>	Note 1
	Active	T <sub>HD</sub>	640				
	Blanking	T <sub>HB</sub>	130	160	430		
Vertical Section	Period	T <sub>V</sub>	520	525	622	T <sub>LINE</sub>	Note 1
	Active	T <sub>VD</sub>	480				
	Blanking	T <sub>VB</sub>	40	45	142		

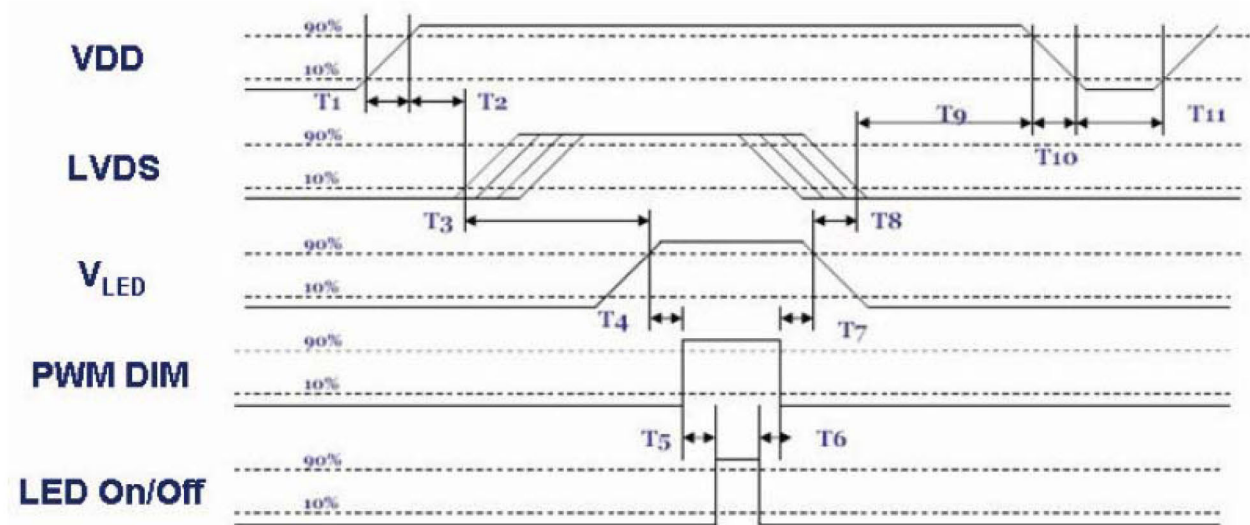
Note 1: Recommended frame rate is 60 Hz.

Input Timing diagram



## Power ON/OFF Sequence

VDD power, LCD interface signals and backlight on/off sequence are shown in the following chart. Signals from any system shall be Hi-Z state or low level when VDD is off.



Power ON/OFF sequence timing

Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.5	-	10	ms
T2	30	40	50	ms
T3	200	-	-	ms
T4	10	-	-	ms
T5	10	-	-	ms
T6	0	-	-	ms
T7	10	-	-	ms
T8	100	-	-	ms
T9	0	16	50	ms
T10	-	-	10	ms
T11	1000	-	-	ms

ON/OFF sequence should be applied to avoid abnormal function in the display. Please make sure to turn off the power when you plug the cable into the input connector or pull the cable out of the connector.

## 5.0 CONNECTOR and PIN ASSIGNMENT

### TFT LCD Connector & Pin Assignment

<b>Manufacturer</b>	STM
<b>Connector Model Number</b>	MSB24013P20, compatible with I-PEX 20268-020E
<b>Mating Connector Model Number</b>	Hirose DF19 -20S-1C or compatible

Pin#	Symbol	Pin#	Symbol
1	VDD	11	RxIN3-
2	VDD	12	RxIN3+
3	GND	13	GND
4	SEL68	14	RxCLKIN-
5	RxIN1-	15	RxCLKIN+
6	RxIN1+	16	NC
7	GND	17	U/D
8	RxIN2-	18	R/L
9	RxIN2+	19	RxIN4-
10	GND	20	RxIN4+

### Backlight Connector & Pin Assignment

<b>Manufacturer</b>	STM
<b>Connector Model Number</b>	MS24016RHD, compatible with MOLEX 53261-0671
<b>Mating Connector Model Number</b>	STM P24016 or compatible

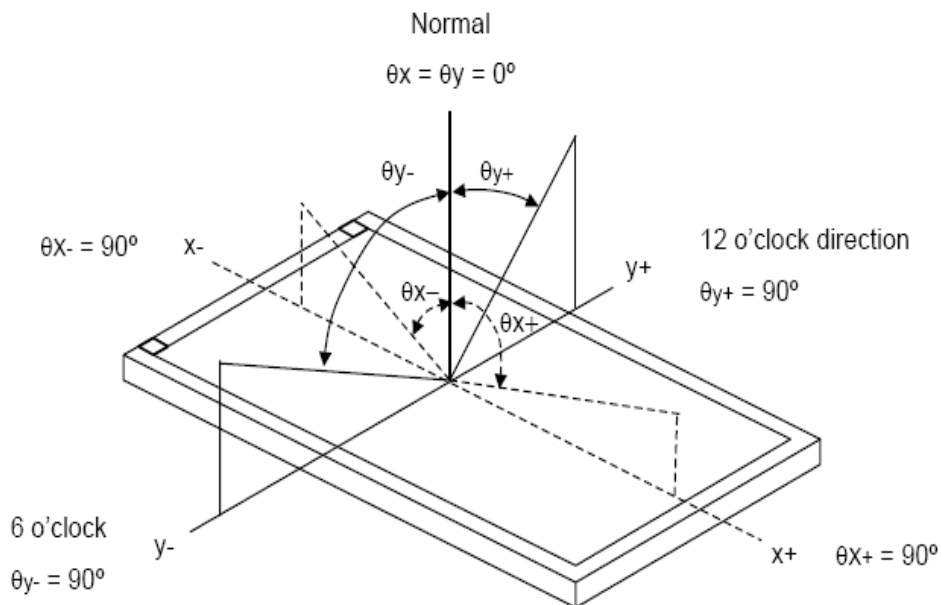
Pin #	Symbol	Pin #	Symbol
1	V <sub>LED</sub>	4	GND
2	V <sub>LED</sub>	5	LED ON/OFF
3	GND	6	PWM DIM

## 6.0 OPTICAL SPECIFICATION

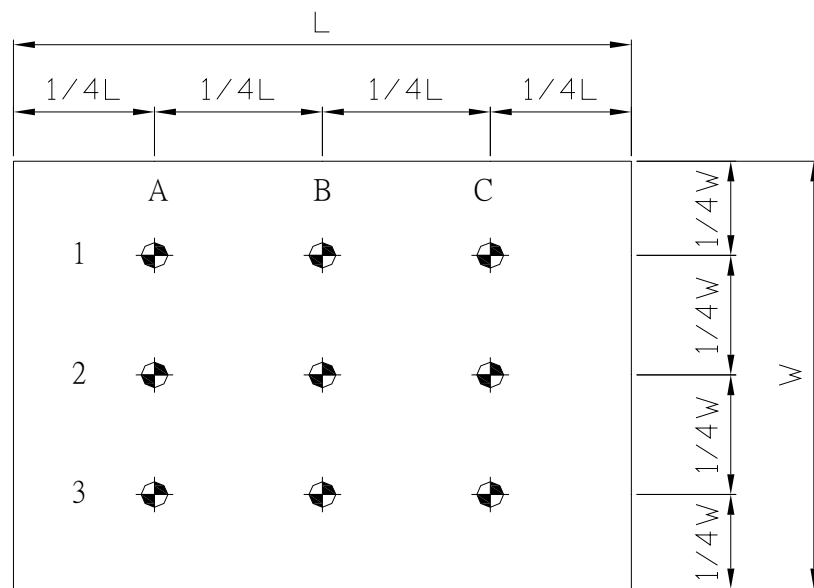
Item		Symbol	Condition	Data	Unit	Note	
Color chromaticity	Red	R <sub>x</sub>	$\theta_x=0$ $\theta_y=0$ BM-7	0.599	-	Test Mode : (1) (2) (3)	
		R <sub>y</sub>		0.379	-		
	Green	G <sub>x</sub>		0.325	-		
		G <sub>y</sub>		0.605	-		
	Blue	B <sub>x</sub>		0.145	-		
		B <sub>y</sub>		0.114	-		
	White	W <sub>x</sub>		0.311	-		
		W <sub>y</sub>		0.349	-		
	Center Luminance of White			L <sub>c</sub>	1000±10%		cd/m <sup>2</sup>
	Average			L <sub>a</sub>	950		cd/m <sup>2</sup>
Uniform		L <sub>u</sub>	75±5	%			
Contrast Ratio		CR	$\theta_x=0$	600	-	Test Mode : (1) (4)	
Color Saturation		NTSC	$\theta_y=0$ Klein K-10	55	%		
Viewing Angle	Horizontal	$\theta_{x+}$	CR≥10	80	Deg	Test Mode : (1) (3)	
		$\theta_{x-}$		80			
	Vertical	$\theta_{y+}$		70			
		$\theta_{y-}$		70			

### Test Mode :

(1) Definition of Viewing Angle ( $\theta_x$  ,  $\theta_y$ ) :

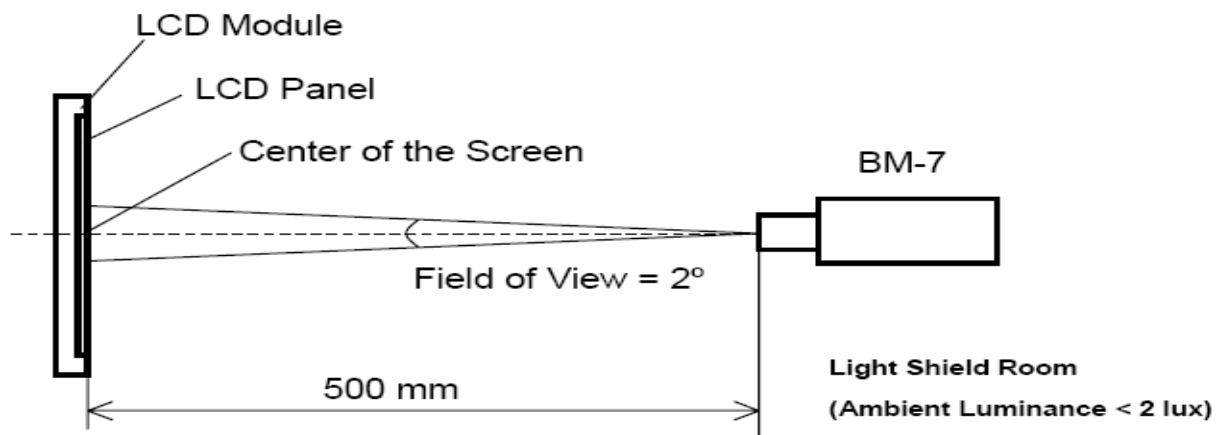


(2) Definition of Test Point :

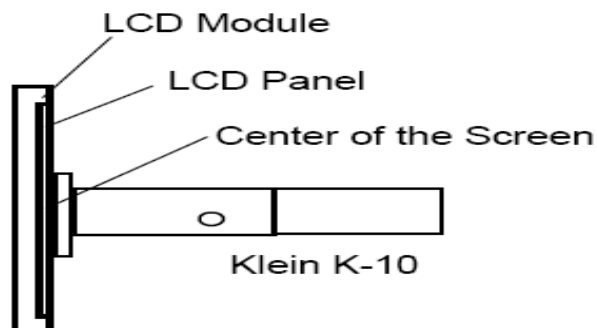


Active Area

(3) **BM-7** Measurement Setup:



(4) **Klein K-10** Measurement Setup:



## 7.0 LED Backlight Unit Driving

### 1. Parameter guideline for LED driving

Following characteristics are measured under stable condition at 25 degree C (room temperature).

Symbol	Parameter	Min	Typ	Max	Units	Remark
$V_{LED}$	Input Voltage	9	12	20	Volt	
$I_{LED}$	Input Current	-	0.25		A	100% PWM duty
$P_{LED}$	Power Consumption	-	3.0		W	100% PWM duty
$I_{rush_{LED}}$	Inrush Current	-	0.37	0.41	A	100% PWM duty
$V_{LED\ On/Off}$	On Control Voltage		3.3		Volt	
	Off Control Voltage		0		Volt	
$V_{PWM}$	Dimming control Voltage High	3.0	3.3	5.5	Volt	
	Dimming control Voltage Low	0		0.1	Volt	
$F_{PWM}$	Dimming Frequency	200		30K	Hz	
$D_{PWM}$	Dimming duty cycle	1		100	%	
Operating Life		50000			Hrs	Note 2, 3

Note 1: See Section 6.6 for LED Backlight Unit Interface Signal Description.

Note 2: If G065VN01 V2 module is driven at high ambient temperature & humidity condition. The operating life will be reduced.

Note 3: Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

### LED Backlight Unit Interface Signal Description

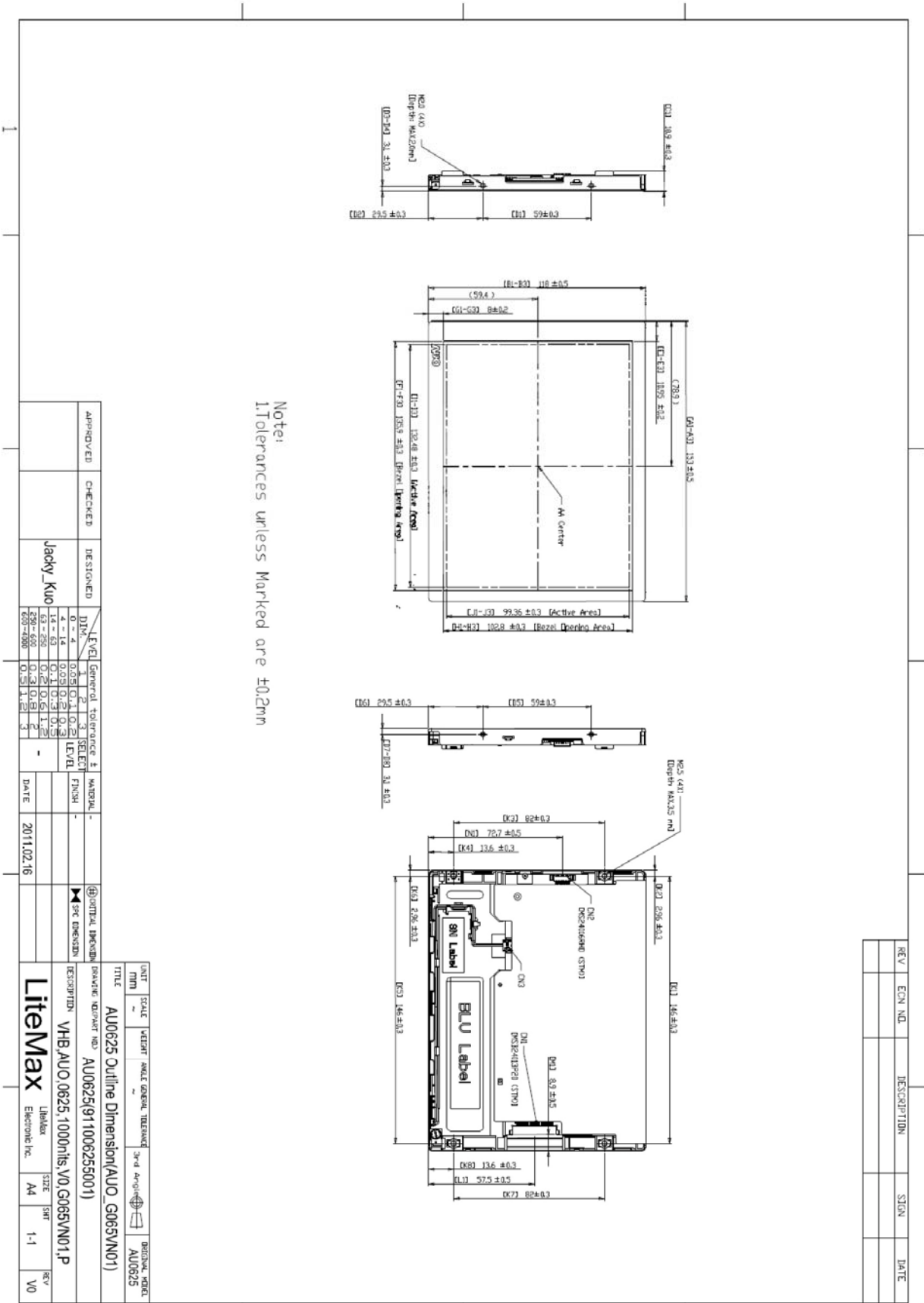
Pin #	Symbol	Pin Description
1	$V_{LED}$	12V input
2	$V_{LED}$	12V input
3	GND	Ground
4	GND	Ground
5	LED On/Off	3.3V-On; 0V/NC-Off
6	PWM DIM	1~100%

Note 1: "NC stands for "No Connection".



8.0 MECHANICAL DRAWING

DLF/DLH0625



## 9.0 PRECAUTIONS

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### HANDLING PRECAUTIONS

- (1) The module should be assembled into the system firmly by using every mounting hole. Be careful not to twist or bend the module.
- (2) While assembling or installing modules, it can only be in the clean area. The dust and oil may cause electrical short or damage the polarizer.
- (3) Use fingerstalls or soft gloves in order to keep display clean during the incoming inspection and assembly process.
- (4) Do not press or scratch the surface harder than a HB pencil lead on the panel because the polarizer is very soft and easily scratched.
- (5) If the surface of the polarizer is dirty, please clean it by some absorbent cotton or soft cloth. Do not use Ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanently damage the polarizer due to chemical reaction.
- (6) Wipe off water droplets or oil immediately. Staining and discoloration may occur if they left on panel for a long time.
- (7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contacting with hands, legs or clothes, it must be washed away thoroughly with soap.
- (8) Protect the module from static electricity, it may cause damage to the C-MOS Gate Array IC.
- (9) Do not disassemble the module.
- (10) Do not pull or fold the lamp wire.
- (11) Pins of I/F connector should not be touched directly with bare hands.

### STORAGE PRECAUTIONS

- (1) High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.
- (2) It is dangerous that moisture come into or contacted the LCD module, because the moisture may damage LCD module when it is operating.
- (3) It may reduce the display quality if the ambient temperature is lower than 10 °C. For example, the response time will become slowly, and the starting voltage of lamp will be higher than the room temperature.

### OPERATION PRECAUTIONS

- (1) Do not pull the I/F connector in or out while the module is operating.
- (2) Always follow the correct power on/off sequence when LCD module is connecting and operating. This can prevent the CMOS LSI chips from damage during latch-up.